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**Energy Systems Division  
Chemical Hygiene Plan**

**dated  
December 2002**

**and I have read and understand  
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**Return to Amy Singletary, ES, 362, Rm. E377**

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**Energy Systems Division  
Chemical Hygiene Plan**

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**December 2002**

**Energy Systems Division  
Argonne National Laboratory**

Operated by The University of Chicago  
under contract W-31-109-Eng-38, for the  
**United States Department of Energy**

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## **Energy Systems Division Chemical Hygiene Plan**

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**December 2002**

Approved:

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W. Schertz, Division Director

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A. Singletary, ES Chemical Hygiene Officer

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J. Woodring, EQO-IH

**ES DIVISION MANAGEMENT HAS READ THIS DOCUMENT AND GIVEN ITS APPROVAL TO IMPLEMENT THIS CHEMICAL HYGIENE PLAN IN COMPLIANCE WITH OSHA REQUIREMENTS. ALL EMPLOYEES ARE REQUIRED TO ABIDE FAITHFULLY BY ITS INTENT FOR THEIR HEALTH AND SAFETY AND FOR THAT OF THEIR FELLOW EMPLOYEES.**

## **Topics**

<b>1</b>	<b>General Principles</b>	<b>2</b>
1.1	Minimization of Exposure	2
1.2	Avoiding Underestimation of Risk	2
1.3	Employee Exposure Assessment	2
1.4	Engineering Controls	2
1.5	Availability of Supporting Documentation	2
<b>2</b>	<b>Levels of Responsibility</b>	<b>2</b>
2.1	Division Director	2
2.2	Site Chemical Hygiene Officer	3
2.3	Division ES&H Coordinator	3
2.4	Division Chemical Hygiene Officer (DCHO)	3
2.5	Environmental Compliance Representative	4
2.6	Area Emergency Supervisor and Alternate	4
2.7	Lockout/Tagout Custodian	4
2.8	Building Manager	4
2.9	Training Management System Representative	4
2.10	Laboratory Custodian	5
2.11	Laboratory Worker	5
<b>3</b>	<b>Exposure Assessment and Reduction</b>	<b>5</b>
3.1	Hazard Identification	5
3.2	Chemical Procurement, Distribution, and Storage	6
3.2.1	Procurement	6
3.2.2	Laboratory Storage	6
3.3	Laboratory Safety Operating Procedures	7
3.3.1	Working with Chemicals	7
3.3.2	Laboratory Workplace Hygiene	7
3.4	Employee Exposure Determination and Evaluation	10
3.5	Engineering Controls	11
3.6	Designated Areas	11
3.7	Emergency Plan/Spill Control	12
<b>4</b>	<b>Training Program</b>	<b>13</b>
<b>5</b>	<b>Medical Consultation and Evaluation</b>	<b>13</b>
<b>6</b>	<b>Respirator Use</b>	<b>13</b>
<b>7</b>	<b>Transportation of Hazardous and Non-Hazardous Materials</b>	<b>14</b>
<b>8</b>	<b>Waste Disposal/Waste Minimization Program</b>	<b>14</b>
<b>9</b>	<b>Record Keeping</b>	<b>15</b>
<b>10</b>	<b>Appendices</b>	<b>15</b>
10.1	Hazardous Chemical Information Sources	15
10.2	OSHA Specifically Regulated Substances	16
10.3	Site-wide Inventory and Hazardous Chemical Listings	17
10.4	ANL Policies and Procedures	17

# **CHEMICAL HYGIENE PLAN**

## **Energy Systems Division**

### **Purpose**

The purpose of the Chemical Hygiene Plan is to establish a program ensuring that control methodologies are implemented to prevent unacceptable exposure to hazardous chemicals in laboratories.

### **Scope**

This plan applies to laboratory operations using hazardous chemicals in relatively small quantities. For operations involving chemicals and not designated as laboratory operations, all other OSHA standards in 29 CFR Part 1910, including exposure standards, continue to apply. In addition to provisions of this plan, the ANL Environment, Safety and Health Manual shall also apply.

### **Objective**

The objective of this plan is to promote the improvement of laboratory health and safety by ensuring that the proper procedures, training, and a written chemical hygiene plan are in compliance with 29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories" (also known as the OSHA Laboratory Standard), as well as other applicable regulations the Laboratory is required to follow.

## **1. GENERAL PRINCIPLES**

All chemicals, because of concentration, toxicity, flammability, carcinogenicity, or other characteristics, are potential health hazards. The intent of the Chemical Hygiene Plan is to provide guidelines for handling and using chemicals without causing harm to oneself, to other employees, or to the laboratory environment.

### **1.1 Minimization of Exposure**

Even for substances with no known significant hazard, exposure should be minimized. When working with substances that present special hazards, special precautions should be taken. Engineering controls and personal protective equipment should be used to minimize exposures.

### **1.2 Avoiding Underestimation of Risk**

One should assume that a mixture presents all the hazards of its components. One should assume that all substances of unknown toxicity are toxic.

### **1.3 Employee Exposure Assessment**

Maintain employee exposure below the OSHA Permissible Exposure Limits (PEL) and other applicable exposure limits by informed exposure-potential assessment and workplace exposure monitoring, as appropriate.

### **1.4 Engineering Controls**

Engineering controls, such as laboratory hoods, local exhaust ventilation, enclosures, etc., will be applied in preference to primary dependence on personal protective equipment, such as respirators.

### **1.5 Availability of Supporting Documentation**

Reference material is available in the Office of the Division Director, the office of the Division Chemical Hygiene Officer, or the 362 Library. The list of materials available is shown in Section 10, Appendices.

## **2. LEVELS OF RESPONSIBILITY**

### **2.1 Division Director**

The Division Director shall ensure ES & H program implementation. Each Division Director shall appoint an ES&H Coordinator, Chemical Hygiene Officer, Environmental Compliance Representative, Lockout/Tagout Custodian, Area Emergency Supervisor and Alternate, Training Management Representative, and Laboratory Custodians. The Division Director also:

- Ensures that the DOE health and safety poster is displayed on official bulletin boards.
- Ensures that employees are aware of their rights, responsibilities, and the process used within the division to report safety concerns.
- Provides continuing support for chemical hygiene activities and the health and safety of laboratory employees.

## **2.2 Site Chemical Hygiene Officer (SCHO)**

The SCHO provides site-wide coordination and support for Division Chemical Hygiene Officers and Safety Coordinators. The SCHO for Argonne may be contacted at [200/L172](#), telephone [2-5641](#) or page [\(630\) 612-0473](#).

## **2.3 Division ES&H Coordinator**

- Coordinate ES&H policy implementation within the division and act as the principal contact to Waste Management Operations (WMO) and the Environment, Safety and Health/Quality Assurance Oversight Group (EQO).
- Maintains the division safety charter. Coordinates the activities of the division committees established to address ES&H matters and maintains the appropriate committee charter.
- Conducts and provides division specific ESH orientation for new employees. Ensures that employee training profiles are current and that the required training is accomplished, and the division ESH records are maintained.
- Coordinates and participates in accident/illness and near-miss investigations.
- Coordinates division safety inspections and follow-up on the reporting and correction of sub standard conditions.
- Reviews purchase requests and design proposals to identify potential hazards and to ensure adequate safety review has taken place.
- Coordinates division ESH experimental design reviews.
- Ensures that ESH related posting requirements pertaining to life safety, environmental protection, hazard communication, etc. are met.
- Maintains cognizance of division activities in order to ensure safety and health support as needed.

## **2.4 Division Chemical Hygiene Officer (DCHO)**

The DCHO is a technically-qualified individual designated by Division management. The ES Division's DCHO may be contacted at Bldg. [362/E377](#), telephone [2-0484](#), or page [630/722-0135](#). The role/function of the DCHO is to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. The DCHO:

- Works with administrators and employees to develop and implement appropriate chemical hygiene policies and practices.
- Monitors the procurement, use, and disposal of chemicals used in the area of responsibility, in conjunction with the laboratory custodians.
- Reviews and approves operations as stated in the Chemical Hygiene Plan, that require the approval process.
- Provides constant oversight on implementation of the Chemical Hygiene Plan.
- Ensures that periodic audits of the program are conducted.
- Helps project directors identify hazards, appropriate controls, and develop adequate facilities, as they apply to the OSHA Laboratory Standard.
- Knows the current legal requirements concerning regulated substances and maintain appropriate reference sources.
- Annually reviews, evaluates, and updates the Chemical Hygiene Plan for the area of responsibility to include a reassessment of division operations covered by the OSHA Laboratory Standard. The annual update shall incorporate all newly-developed relevant health and safety issues for the Division and changes in regulations and interpretations.

## **2.5 Environmental Compliance Representative**

- Ensures compliance with regulatory requirements and protection of human health and the environment.
- Enforces division policy and procedures that display commitment to the laboratory's environmental policies and practices.
- Ensures proper coordination of environmental matters with the Environmental Compliance Coordinator.
- Ensures that leaks and spills are identified and reported in a timely manner and ensures corrective action is taken as needed.
- Ensures that experiment review includes environmental protection considerations.
- Coordinates within the division, data collection and other information required to support required environmental permit applications.

## **2.6 Area Emergency Supervisor and Alternate**

- Ensures that experiment review includes environmental protection considerations.
- Responsible for emergency response activities in their facilities. This may include ordering the evacuation of facility personnel, the safe and orderly shutdown of facilities and equipment, and providing resources and assistance to the incident commander or crisis manager for specific hazards.
- Maintains the emergency plan for his/her facility, performs annual updates, conducts annual training and exercises, and introduces new employees to emergency procedures.

## **2.7 Lockout/Tagout Custodian**

- Conducts and document monthly inspections in the logbook to verify that energy control procedures are followed in accordance with chapter 7-1 in the ESH Manual.
- Verifies that locks are properly attached and the equipment is properly secured.
- Maintains documentation as required.

## **2.8 Building Manager**

- Interfaces with PFS to ensure that deficiencies are remedied.
- Provides building occupants with building specific safety orientation.

## **2.9 Training Management System Representative**

- Link between division management, division personnel, and the TMS representative assists supervisors by advising them on employee training requirements.
- Enters the JHQ responses into the TMS after completion.
- Provides reports used to help manage training.
- Provides personnel training profiles to division management quarterly.
- Enrolls personnel in training sessions.



## **2.10 Laboratory Custodian**

Overall responsibility for chemical hygiene in the laboratory resides with the Laboratory Custodian. The Laboratory Custodian:

- Has authority to STOP work in the lab if unsafe conditions exist.
- Verifies that all projects within their laboratory have a Health and Safety Plan that is current and has been reviewed within the last year.
- Participates in reviews pertaining to projects within the lab.
- Coordinates and schedules multiple projects within the lab if conflicts result in ESH concerns.
- Ensures that a Satellite Waste Accumulation Area is designated within the lab.
- Ensures that the laboratory waste log book is up-to-date and waste is being disposed of in a timely manner.
- Ensures all Material Safety Data Sheets for the chemicals within their lab are in the MSDS Book and are available from the Chemical Management System.
- Verifies that Carcinogen SOP's are maintained and current within the laboratory notebook.
- Verifies that new students have received the appropriate training and have reviewed the Division Chemical Hygiene Plan and Safety Charter.
- Verifies that all chemicals within their laboratory are appropriately bar-coded. If a chemical is received without a barcode, contact [Amy Singletary](#) at ext. 2-0484.
- Ensures appropriate disposition of chemicals and waste associated with departing lab tenants.
- Ensures that personal protective equipment is being utilized and in good condition.
- Provides regular chemical hygiene and housekeeping inspections.
- Maintains housekeeping within the lab.
- Maintains compliance with the Chemical Hygiene Plan.

## **2.11 Laboratory Worker**

The laboratory worker is required to conduct each experiment/operation in compliance with the approved procedures and with good personal hygiene practices.

- Responsible for following approved safety plans.
- Required to coordinate each experiment/operation with the Laboratory Custodian.
- Laboratory personnel are responsible for placing warning signs and labels on all chemical containers and on equipment or areas where special or unusual hazardous chemicals are in use.
- Responsible for always wearing safety glasses, long pants, and ¾ length sleeves in laboratories. Procures all PPE required by project safety plan specifications.
- Maintains compliance with the Chemical Hygiene Plan and Safety Charter.

# **3. EXPOSURE ASSESSMENT AND REDUCTION**

## **3.1 Hazard Identification**

Sufficient information about the hazardous and toxic properties of chemicals must be obtained to allow safe handling. Chemicals presenting an unusual or severe exposure hazard require notification and approval by the DCHO, as specified in Section [4.3.1](#).

Labels on incoming containers shall not be removed or defaced. All chemicals within the laboratory must be appropriately bar-coded. If a chemical is received without a barcode contact Amy Singletary at ext. 2-0484.

When chemicals are packaged or repackaged at ANL, the container into which the chemicals are placed shall be properly labeled to indicate the identity and hazards. Refer to ANL Environment, Safety and Health Manual, Chapter [4-1](#) "Hazard Communication" for guidance.

A known chemical produced in a laboratory shall be evaluated by reviewing the available literature to determine if it is a hazardous chemical. An unknown chemical composition shall be treated as a hazardous substance.

Material Safety Data Sheets (MSDSs) must be kept readily available for all chemical substances. If a current (i.e., completed within the last six years) MSDS is not available, it should be requested whenever a chemical product is ordered. When a MSDS is received, make a copy of it for your files. If an MSDS is obtained for a chemical in which there is no MSDS for it in CMS give a copy of it to your Division CMS representative for addition to the CMS database. MSDS's of barcoded chemicals are now available on the web through the Chemical Management System (CMS) at <http://www.anl.gov/ESH/cms/>

If a chemical is produced for someone outside the laboratory, the chemical must have a hazard warning label, and a Material Safety Data Sheet must be prepared and provided to the user. EQO-IH ([2-3310](#)) can help in the preparation of an MSDS. EQO-IH and the DCHO must be consulted for review of a Material Safety Data Sheet before it is sent outside the Laboratory. There is a four page form that must be used for preparing a new MSDS. It is available through EQO-IH at [2-4674](#). The new substance producer should incorporate the information they have and send the form to EQO-IH for additional information. Refer to ANL Environment, Safety and Health Manual, Chapter [4-1](#) for guidance.

### **3.2 Chemical Procurement, Distribution, and Storage**

#### **3.2.1 Procurement**

All chemicals must be ordered through [Vernetta Carten](#), ext. [2-3009](#). All chemical orders must be authorized by the DCHO.

Before a substance is received, information on proper handling, storage, and disposal must be known to those who will be involved. Do not accept any container that does not have an adequate identifying label.

The DCHO will coordinate the maintenance of an inventory of chemicals and chemical products through the site-wide inventory program.

Any personnel obtaining samples from an outside source are personally responsible to notify the DCHO.

#### **3.2.2 Laboratory Storage**

Chemical storage within laboratories must be kept to reasonable quantities consistent with work in progress. In multi-user laboratories chemicals must be labeled with the owners initials and date. Outdated, excessive, and unneeded chemicals must be disposed of through Waste Management Operations (WMO). Consult the ANL Waste Handling Procedures Manual.

Flammable and combustible liquids must be stored in accordance with the ANL Environment, Safety and Health Manual, Chapter [11-3](#), "Flammable and Combustible Liquids." In general, flammable materials of 1 to 5 gal should be stored in approved safety containers if purity reasons allow it. An approved flammable liquids storage cabinet is required if there are more than five gallons total of flammable and combustible liquids in any single room or laboratory. Flammable materials must not be stored in refrigerators unless the refrigerator is listed by Underwriters Laboratories specifically for flammable liquids storage and it is posted with an "Approved for Flammable Liquids" sign that is available through PFS-Fire Protection.

Chemical storage in fume-hood work areas is not acceptable, except where highly volatile or noxious materials are in containers that may not be vapor tight and where placement in the hood does not interfere with proper hood operation.

Cooperation with a site-wide chemical inventory effort is required. This will be conducted every three years; unwanted and outdated chemicals should be searched for and properly disposed of as part of this process.

### **3.3 Laboratory Safety Operating Procedures**

#### **3.3.1 Working with Chemicals**

This section provides some general and specific guidance on handling chemicals. Additional requirements are included in the ANL Environment, Safety and Health Manual and the Energy Systems Division Safety Charter and Procedures. A copy of the Energy Systems Division Safety Charter and Procedures has been provided to all staff employees, and it may be obtained from the DSC ([Bldg. 362/E377](#)).

Management will ensure that appropriate personal protective equipment, such as eye protection, chemical-resistant gloves, and respiratory equipment, is used when necessary.

The laboratory worker is responsible for complying with policies and procedures on the use of personal protective equipment and for removing contaminated equipment before leaving the work area.

Review by and concurrence of the SCHO is required for the following procedures:

- a. Work with highly acutely toxic materials. As a general rule, this applies to those substances with exposure limits below 1 ppm or 0.5 mg/m<sup>3</sup> of air.
- b. Work with Class 1 or Class 2 carcinogens (refer to ANL Environment, Safety and Health Manual, Chapter [4-5](#) "Chemical Carcinogens").
- c. Work with reproductive hazards.
- d. Purchase of any chemicals in the Division. The DCHO will review the purchase and the intended use to ascertain whether the chemical already exists in the Division, or whether a less toxic substitute is available.

All new Laboratory projects require pre-operation safety reviews. Persons planning a project should discuss the project with the DSC before starting on the safety plan to reduce problems during the safety review. Consult the Energy Systems Division Safety Charter and Procedures and the ANL Environment, Safety and Health Manual for additional guidance.

#### **3.3.2 Laboratory Workplace Hygiene**

This section contains general guidance for working with toxic and hazardous chemicals. See the appropriate chapters of the ANL Environment, Safety and Health Manual for more guidance.

- a. Materials containing asbestos, such as gloves, clamps, insulation, and wiring should be disposed of using approved procedures. Consult with EQO-IH regarding procedures and requirements. Removal must be done only by qualified personnel.

- b. Personal hygiene:
- Avoid unnecessary exposure to chemicals by any route. Do not deliberately smell or taste chemicals.
  - Never pipette anything by mouth.
  - Avoid eating, drinking, and smoking in areas where chemicals are present. (Note: eating, drinking, or smoking is prohibited in all laboratories in the Energy Systems Division.)
  - Wash hands before leaving a laboratory or after any work with chemicals.
  - Storage of food and drink in laboratories, storage areas, or refrigerators used for laboratory operations is prohibited.
- c. Avoid the release of toxic substances in unventilated spaces. The ES Division cold room (362/F009) does not have ventilation, and therefore, volatile chemicals stored in this room **must not** be opened in the room. The environmental chamber in Bldg. 485 (greenhouse) has a similar restriction.
- d. Refer to ANL Environment, Safety and Health Manual, Chapter 4-5, "Chemical Carcinogens," for requirements for carcinogen handling, labeling, and Standard Operating Procedures (SOPs).
- e. Ovens used for processing hazardous chemicals must be ventilated properly to control any hazardous emissions. If an oven is not **marked** as ventilated, it cannot be used for hazardous chemicals.
- f. Seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before starting any new operation. This is required in the ES Safety Charter, as well as in the required safety review.
- g. When venting containers, or setting up containers with pressure relief valves, take precautions to ensure that the discharge is directed safely. Be sure to relieve gas pressure from cylinder regulators before disconnecting. It is good practice to stand to the side of gauge faces when opening regulator valves.
- h. Use a fume hood for operations that might result in the release of toxic gases, vapors, or particulates. As a rule of thumb, engineering controls need to be used when handling any volatile substance with a TLV of less than 50 ppm, or an LC<sub>50</sub> of less than 200 ppm, or an oral LD<sub>50</sub> of less than 500 mg/kg.
- i. Ensure that the safety review for each laboratory operation includes plans for waste disposal. Apply waste minimization whenever feasible.
- j. Know the location of eyewash and shower facilities for your laboratory and how to use them. They are required in each laboratory where hazardous chemicals are used.
- k. Use face shields, proper gloves, and aprons, as appropriate, to avoid contact with chemicals. Safety glasses or chemical goggles are necessary in addition to face shields. Select carcinogens require the use of chemical goggles. A "Protective Glove Selection Guide" has been developed by and is available through EQO-Industrial Hygiene. It will be included in the Laboratory Safety Notebook in each laboratory. Additional glove selection information is available from EQO-IH (2-3310). To supplement specific-procedure training provided by supervisors, refer also to the National Research Council's "Prudent Practices for

Handling Hazardous Chemicals in Laboratories," available in the Building 200 library reference section.

- l. When diluting concentrated acid, add acid to the diluent. Use an ice bath, or have a cold water source available, to reduce the reactivity hazards from extremely exothermic reactions.
- m. The date of receipt and date of opening must be recorded on containers of chemicals that could present a long-term storage hazard (e.g., peroxide-forming ethers, unsaturated aliphatics, picric acid, and certain metal azides, for example). See the ES&H Manual, Chapter 4-3, for specific storage recommendations. When the expiration date has been exceeded, the chemical must be disposed through WMO. Expiration Dated Substance Reports are available and printed annually by the TMS representative. Peroxide formers can be tested for peroxide. If none is found, the chemical can be kept for another storage period. If some is found, it can be treated to remove the peroxide and kept for another storage period.
- n. Special procedures may be required for certain extremely hazardous chemicals (e.g., phenol and sodium azide) and OSHA specifically-regulated chemicals, such as benzene and formaldehyde. For more information refer to Section 10.2 of this document.
- o. Chemical use outside of a laboratory hood requires evaluation of the exposure potential of toxic materials that may cause air contamination and of the possible need for respiratory protection or other controls.
- p. Wear appropriate protective apparel and gloves to prevent hand contact with allergens or substances of unknown allergenic activity (examples include diazomethane, isocyanates, and bichromates).
- q. Special care shall be taken to minimize chemical and radiation exposure during pregnancy. Chemical handling operations during pregnancy require a review of work practice changes to accomplish this. Notification of the DCHO is also suggested.
- r. Pregnant laboratory workers are requested to consult with the Medical Department at an early stage.
- s. Before using hydrofluoric acid, HF, please look at the ESH Manual Chapter 4-3 page 9 for precautions. If possible, include about 10% nitric acid in the HF so that your skin will be marked letting you know that a HF spill has occurred. HF gives no indication of being on the skin until after several hours at which time it is too late to treat.  
Calcium gluconate tubes, obtained from medical, should also be kept in areas where hydrofluoric acid is used. The basic procedures for obtaining and using calcium gluconate are:
  - Medical orders a supply of the calcium gluconate tubes and logs them into CMS
  - Tubes are sent to users on request and ownership is transferred to the user in CMS
  - The user needs to accept them into their CMS record and store them in an accessible and posted location.
  - The tubes should have an expiration date set in the CMS record; it could also be noted on the tube. The shelf life is usually 1 year.

### 3.4 Employee Exposure Determination and Evaluation

Current and proposed uses of hazardous chemicals must be assessed as to the potential for workplace exposure. The criteria to be used in determining the adequacy of controls include whether airborne exposures may exceed established limits and whether dermal exposure can cause skin injury or absorption of toxic quantities. For materials that may have irreversible toxic effects or be classified as carcinogens, the concept of maintaining exposure as low as reasonably achievable (ALARA) should be followed. Factors to be considered in making the determination of exposure potential include the following:

- a. Physical and chemical properties of compound or mixture.
- b. Quantity used and frequency of use outside of a fume hood.
- c. Open container vs. covered systems and potential for airborne exposure.
- d. Exposure controls currently in place.
- e. Chemical stability of the compound.
- f. Volatility or vapor pressure.
- g. Established occupational exposure limits, such as Occupational Safety and Health Act, OSHA, Permissible Exposure Limit (PEL), and the American Conference of Governmental Industrial Hygienist, ACGIH, Threshold Limit Values (TLV).
- h. Toxicological information about the substance.
- i. Review of handling precautions and hazards indicated on the manufacturer's Material Safety Data Sheet.

The initial review of exposure potential must be made by the laboratory custodian. If there is concern about the possible extent of exposures or a need for additional information, this information should be sought from the SCHO and then EQO-IH.

During annual safety review of a project, work with highly toxic materials and carcinogenic materials must be discussed and evaluated. Where exposure limits have not been developed, materials with an oral LD<sub>50</sub> of less than 500 mg/kg are to be considered highly toxic. This corresponds to the very toxic grouping used in "Clinical Toxicology of Commercial Products" by Gosselin, Smith, and Hodge and indicates materials for which about 1 ounce orally might be lethal to a human. Using significant quantities of a volatile liquid that have a TLV of 50 ppm or less should be done in a hood.

Where the need is indicated, EQO-Industrial Hygiene will provide on site review and exposure determination measurements with results reported back to the supervisor. Supervisors are required to report results in writing to affected employees, either by personal communication or by posting of the results.

When monitoring has demonstrated that permissible exposure limits might be exceeded, or readily achievable improvements can further reduce exposures, such improvements will be implemented. Help implementing these changes will be provided by the Laboratory Custodian, SCHO, and EQO-IH.

### **3.5 Engineering Controls**

All laboratory fume hoods are to be tested annually by PFS-Building Maintenance personnel. Hoods designated for general chemical use ([Class C](#)) must maintain a minimum of 100 feet per minute (fpm) face velocity; those for radioactive or higher toxicity materials ([Class R](#)) must maintain at least 120 feet per minute (fpm) face velocity.

Any hoods not posted as being tested and meeting the above criteria within the past year must be brought to the attention of PFS-Building Maintenance by the laboratory custodian.

Hoods failing to meet the above test criteria will be tagged at the time of service, and a written notice will be sent to the Division office. Hoods so tagged must be taken out of service until repaired or posted as to restricted service, as approved by the SCHO.

Hoods are tested at 16" opening and should be used with a 16" or less opening to ensure adequate face velocity. The sashes should be closed when not in use. Objects should be kept at least 6" from both the front and the back of the hood. Large items should be elevated off the floor of the hood to allow air to move under them. Please refer to the Chapter 7-11 in the ESH Manual for more information.

Snorkel venting of selected equipment may be used to remove exhaust effluent or emissions from equipment. Each installation of such equipment must be approved by a safety review and the SCHO.

It is strongly recommended that each laboratory in the division has a Dwyer Vaneometer. The Vaneometer measures linear air flow from 25 to 400 FPM. To check the face velocity, the hood should first be adjusted to a sixteen inch opening. This should be marked on the side of the hood to allow easy positioning. The Vaneometer should be held near the center of the opening. You should stand to the side so that your body does not disrupt the airflow. Please contact the DSC for help in purchasing a Vaneometer.

### **3.6 Designated Areas**

The OSHA Laboratory Standard requires that all "select carcinogens, reproductive toxins, or substances that have a high degree of acute toxicity" must be used and stored in a "Designated Area." When working with particularly hazardous substances, additional employee protection is necessary. A designated area (generally a fume hood, but it could be a specifically-designed laboratory) is assigned for use when handling Class 1 carcinogens. (Refer to ANL Environment, Safety and Health Manual, Chapter [4-5](#).) Designated areas are also appropriate for work with certain reproductive toxins and highly acutely toxic substances, especially those with exposure limits below 1 ppm or 0.5 mg/m<sup>3</sup> of air. All areas that are posted as radiation areas should also be declared "designated areas." Asbestos materials including transite bench tops and panels should be posted with a sticker available from EQO-IH which states "DANGER, Contains asbestos fibers, Avoid creating dust, Cancer and lung disease hazard". All carcinogens including asbestos and transite must be reported on form [ESH-189 \(1/92\)](#).

At ANL, many exhaust ventilation systems are connected to the Central Surveillance System (CSS), which provides an alarm in case of flow failure. Hoods using highly toxic materials and not connected to the CSS will be reviewed by the supervisor, laboratory custodian, and SCHO to determine the need for individual hood flow indicators. None of the hoods in the ES Division are currently connected to the CSS.

Special procedures for working in designated areas must be developed and approved by the EQO-IH and SCHO.

Designated work areas must be posted indicating the potential hazard and the requirement to follow the special work procedures established. Designated areas for the Energy Systems Division are as follows:

- a. Laboratories 200/C166 Hood 4, 200/C158 Hood 1&2, 200/C150 Hood 1,2,&4, 362/B200 Hood 1, 362/B208 Hood 1-2, 362/B224 Hood 1, 362/C224 Hood 1, 362/E224 Hood 2, 362/C232 Hood 1, 362/E232 Hood 1, 362/C316 Hoods 1-3, 362/E316 Hoods 1-3, and 362/E324 Hoods 1&2 are fume hoods or walk-in hoods for working with hazardous materials. All work with hazardous materials in these laboratory hoods requires prior approval from the SCHO and a completed safety plan. Each hood that is being used with hazardous material must be posted with a sign that states what materials are being used. If a hood is **not** posted, work with select carcinogens and acutely toxic materials may not be performed.
- b. Laboratory C-288 Hoods 1 and 2 are equipped with a dual-blower exhaust system, with one of the blowers run from emergency backup power. There are warning alarms and flow indicators to verify operation. This laboratory is specifically designed for experiments with H<sub>2</sub>S.
- c. Laboratory 200/C-174, C-166 are specially designed and approved for dilute chemical agent work. Ventilation requirements are 100 fpm  $\pm$  10 with the sash at 18 inches. There are special warning alarms and flow indicators to verify operation. Special training is necessary for entry into this area. If you do not have this training you are not allowed into the labs unescorted.
- d. The following hoods are general-use fume hoods: 200/C174 Hood 1-2, 200/C166 Hood 1-3, 200/C158 Hood 2, 200/C150 Hood 3, 200/C142 Hood 1, 315/N172 Hood 1, 362/E224 Hood 362/C324 Hoods 1-3, and 362/E332 Hood 1-2, 362/E324 Hood 3, and 370/OFF Hood 1&3. General-use fume hoods **cannot** be used for work with select carcinogens or acutely toxic materials.

The ES Safety Charter calls for a safety review of each project. The procedures for handling chemicals in the designated areas will be found in the safety review. Each laboratory custodian maintains a copy of the safety review in the laboratory.

### **3.7 Emergency Plan/Spill Control**

Spills, accidents, explosions, fires, and similar incidents that have resulted or may result in injury or significant property damage must be reported immediately using the Laboratory's 911 Emergency System.

Spills should not be cleaned up by laboratory personnel, unless proper supplies, training, and personal protective equipment have been previously provided. Non-emergency cleanup of identified materials can be requested from Waste Management Operations (WMO) (2-5865).

Any chemical materials used or collected in a spill response incident must be held for proper disposal through Waste Management Operations. Spilled chemicals and contaminated glassware or other containers must not be disposed of in trash receptacles.

For more information refer to the ANL Emergency Management Plan.



#### **4. TRAINING PROGRAM**

All new ANL employees receive basic orientation in health and safety requirements and services of the Laboratory.

Supervisors have a duty to see that each employee is provided the necessary information and training on specific hazards of the materials they may work with. In addition, each employee must be aware of the location of Material Safety Data Sheets covering materials in the workplace.

Employees must also be aware of provisions of the OSHA Laboratory Standard. This will be accomplished:

- by distributing to each employee a copy of the Chemical Hygiene Plan for this Division.
- by distributing to each Laboratory Custodian a copy of the OSHA Laboratory Standard, 29 CFR 1910.1450 to be incorporated into the Laboratory Notebook.

EQO-TR will provide basic training classes on provisions of the OSHA Laboratory Standard and applicable site-wide health and safety programs. The ESH training courses that covers this is Laboratory Hazard Communication. Carcinogen use requirements are fulfilled in the course Safe Handling of Carcinogens. An ANL Job Hazards Questionnaire ([ANL 521](#)) must be completed by all employees; it provides links to training resources. The ES Division will provide specific instructions regarding Division activities.

Documentation of the instruction and information given to employees must be provided to the DSC, to be held in an auditable file.

#### **5. MEDICAL CONSULTATION AND EVALUATION**

Any employee who develops signs and symptoms indicating possible overexposure or adverse effect must be provided with medical attention. The employee must report to his/her supervisor and the ANL Medical Department in Building 201.

When an unusual occurrence, such as a spill, results in a potentially significant exposure, a Dial 911 response must be initiated to ensure that prompt attention is received.

Where review by the SCHO and/or EQO-Industrial Hygiene indicates that significant exposure could occur, a Medical Department consultation will be sought regarding the advisability of biological monitoring for the toxic substance or its metabolites.

#### **6. RESPIRATOR USE**

Engineering controls, such as laboratory hoods, enclosed operations, and lower-toxicity substitute materials, must be the first level of protection. Where engineering controls are not feasible or for temporary operations or where an additional level of protection is desired, respiratory protective equipment may be used.

All respiratory protective equipment selection and user training will be provided by EQO-IH ([2-4149](#)). Retraining is required annually, and the Division Office must be given a copy of the certificate. Approval must be obtained from the ANL Medical Department before a person can be fitted and trained in the use of respirators.

Respiratory protective equipment may not be purchased without prior approval of EQO-IH.

For emergency response situations and where approximate levels of contaminants are unknown, use of self-contained breathing apparatus (SCBA) is required. Only persons who are currently trained in its use are authorized to use such equipment. Retraining is required annually, and the Division Office must be given a copy of the certificate.

For additional procedures related to use of respiratory protective equipment, refer to the ANL Environment, Safety and Health Manual, Chapter 12-2, "Respiratory Protection."

## **7. TRANSPORTATION OF HAZARDOUS AND NON-HAZARDOUS MATERIALS**

Transportation of hazardous materials between buildings or off site must be done by authorized personnel only. Refer to the Transportation Safety Manual ([www.aim.anl.gov/manuals/tsm/index.html](http://www.aim.anl.gov/manuals/tsm/index.html)) for details. Transport of hazardous materials between laboratories within a building is to be in a closed unbreakable secondary containers. Appendix VII of the ES Division Safety Charter and Procedures has a copy of the "Quick Reference - Person to Call" sheet from the Transportation Safety Manual. Transportation of hazardous materials must be done only in approved containers. Approval for containers can be obtained from the Transportation Safety Board (see Chapter 8 of the Transportation Safety Manual).

## **8. WASTE DISPOSAL/WASTE MINIMIZATION PROGRAM**

All waste generated will be handled following the procedures in the ANL Waste Handling Procedures Manual. Each laboratory has a Waste Management Record Book that contains the location of satellite waste accumulation areas, records of all waste generated, and WMO-197 forms (Chemical Waste Disposal Requisitions).

Planning for waste disposal and minimization should be implemented before purchasing a hazardous chemical.

Serious problems of air and water pollution, as well as serious hazards to facility personnel, may be created by improper handling of waste produced even by small-scale laboratory operations.

It is the responsibility of any chemical user to be sure that the ultimate disposal of materials generated in the process or reaction can be safely and properly carried out. Each laboratory custodian has the responsibility to ensure that waste chemicals are safely collected, identified, and stored for disposal, and that the Division Chemical Hygiene Officer is fully advised of any special methods or facilities required. Consideration must be given to the quantities ordered and possible reuse to ensure waste minimization.

Waste must be properly identified, including date started (see ANL Waste Handling Procedures Manual) and packaged for pickup and disposal by Waste Management Operations (WMO). After you have completed form WMO-197 "Chemical Waste Disposal Requisition," call PBC-HP to survey the waste for radiation. PBC-HP will then sign and forward the WMO-197 form to Waste Management Operations to initiate the waste disposal process. Those who sign this form must be current on their chemical waste certification training, i.e., take the initial ESH Chemical Waste Generator Training Course 574 and the ESH Chemical Waste Certification Training Course 456 and the yearly refresher Courses ESH574RF and ESH456RF. Contact the ES Division ESH Training Management Representative to sign up for either of these courses.

For additional guidance on waste disposal and minimization procedures, refer to the ANL Waste Handling Procedures Manual and/or your ES Division Environmental Compliance Representative.

## **9. RECORD KEEPING**

Training records must be provided to the SCHO and to the ES Division ESH Training Coordinator for inclusion in the site-wide employee training database.

The Division ESH Coordinator must maintain Accident Investigations, Project Safety Reviews, and NEPA documentation.

ANL management must maintain records of medical consultation and examinations for 30 years beyond employee/employer separation.

The DCHO must maintain a listing of chemicals and chemical products used in the Division. This listing will be a sub-file of the site-wide chemical inventory.

The SCHO must maintain current records of exposure limits specified by OSHA in 29 CFR 1910, subpart Z and the ACGIH Threshold limit values. Records of workplace exposure monitoring will also be maintained.

## **10. APPENDICES**

### **10.1 Hazardous Chemical Information Sources**

The major health exposure chemical lists and reference sources are as follows:

- OSHA Air Contaminants (29 CFR 1910.1000), see 362 Library Reference
- OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050), see 362 Library Reference
- National Toxicology Program, latest report on carcinogens, see 202 Library, RA1199.N39
- International Agency for Research on Cancer, latest volume on human carcinogens (groups 1, 2A, and 2B), see 202 Library, RC261.W8 1993
- Teratogens identified in Thomas H. Shepard, Catalog of Teratogenic Agents, 6th edition, Johns Hopkins Press, 1989, see 202 Library, QM691.S547 1983
- NIOSH Registry of Toxic Effects of Chemical Substances, latest edition, see 202 Library, RA1215.R337, 5 volume reference
- Dangerous Properties of Industrial Materials, N. Irving Sax, latest edition, see 362 Library Reference
- Pollution Prevention/Waste Minimization Awareness Plan for Argonne National Laboratory, East, see Energy Systems Division office
- TLVS & BEIs, Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, 2002

## 10.2 OSHA Specifically Regulated Substances

**\*Contact the ES Division ESH Coordinator for further information on any regulated substance.**

Section	OSHA Toxic and Hazardous Substances	ACGIH TLV/TWA	OSHA Limits
1910.1001	Asbestos – All Forms	0.1 fibers/cc, A1	0.1 fibers/cc
1910.1002	Coal tar pitch volatiles	0.2 mg/m3, A1	0.2 mg/m3
1910.1003	Nitrobiphenyl, 4- (13 Carcinogens)	No Info. Available	See 1910.1003
1910.1004	Naphthylamine, alpha-	No Info. Available	See 1910.1003
1910.1006	Methyl chloromethyl ether	No Info. Available	See 1910.1003
1910.1007	Dichlorobenzidine, 3,3- and its salts	A3	See 1910.1003
1910.1008	Chloromethyl ether, bis -	.001 ppm, A1	See 1910.1003
1910.1009	Naphthylamine, beta-	A1	See 1910.1003
1910.1010	Benzidine	A1	See 1910.1003
1910.1011	Aminodiphenyl, 4-	A1	See 1910.1003
1910.1012	Ethyleneimine	0.5 ppm, A3	See 1910.1003
1910.1013	Propiolactone, beta-	0.5 ppm, A3	See 1910.1003
1910.1014	Acetylaminofluorene, 2-	No info. Available	See 1910.1003
1910.1015	Dimethylaminoazobenzene, 4-	No info. Available	See 1910.1003
1910.1016	Nitrosodimethylamine, N-	A3	See 1910.1003
1910.1017	Vinyl chloride	1 ppm, A1	1 ppm
1910.1018	Arsenic, inorganic	0.01 mg/m3, A1	0.01 mg/m3
1910.1025	Lead	0.05 mg/m3, A3	0.05 mg/m3
1910.1027	Cadmium	0.002 mg/m3, A2	0.005 mg/m3
1910.1028	Benzene	0.5 ppm, A1	1 ppm
1910.1029	Coke oven emissions	No Info. Available	0.15 mg/m3
1910.1030	Bloodborne Pathogens	No Info. Available	See 1910.1030
1910.1043	Cotton dust	0.2 mg/m3	0.2 mg/m3
1910.1044	Dibromo -3-chloropropane, 1,2-	No Info. Available	1 ppb
1910.1045	Acrylonitrile	2 ppm, A3	2 ppm
1910.1047	Ethylene oxide	1 ppm, A2	1 ppm
1910.1048	Formaldehyde	0.3 ppm as STEL Ceiling, A2	.75 ppm, STEL 2 ppm
1910.1050	Methylene dianiline (MDA)	0.1 ppm, A3	10 ppb
1910.1052	Methylene Chloride (Dichloromethane)	50 ppm , A3	25 ppm

- A1 Confirmed Human Carcinogen
- A2 Suspected Human Carcinogen
- A3 Animal Carcinogen
- A4 Not Classifiable as Human Carcinogen

ACGIH-American Conference of Governmental Industrial Hygienists  
 OSHA-Occupational Safety & Health Administration

Threshold Limit Values (TLV)- Refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day with out adverse effects.

Time-weighted Average (TWA)- the time weighted average concentration for a conventional 8hour workday and a 40-hr. work week, to which nearly all workers my be repeatedly exposed, day after day, without adverse effect.

Short-term Exposure Limit (STEL)- concentration to which workers can be exposed continuously for a short period of time with out suffering from irritation, chronic or irreversible tissue damage, or narcosis of

sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded. A STEL is a 15 minute TWA exposure which should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV-TWA.

### **10.3 Site-wide Inventory and Hazardous Chemical Listings**

The Energy Systems Division currently maintains its chemical records on the site-wide chemical inventory system. This system allows an accurate list of all chemicals maintained in a specific lab. The lists are available for laboratory custodians, and are kept available for reference by employees.

### **10.4 ANL Policies and Procedures**

The following documents are available in the Division Director's Office, E-385, Building 362, or from the Division Chemical Hygiene Officer:

- a. ANL Environment, Safety and Health Manual.
- b. ANL Comprehensive Emergency Management Plan.
- c. ANL Waste Handling Procedures Manual.
- d. ANL Transportation Safety Manual.
- e. ANL Waste Minimization Plan.

**ES DIVISION MANAGEMENT HAS READ THIS DOCUMENT AND GIVEN ITS APPROVAL TO IMPLEMENT THIS CHEMICAL HYGIENE PLAN IN COMPLIANCE WITH OSHA REQUIREMENTS. ALL EMPLOYEES ARE REQUIRED TO ABIDE FAITHFULLY BY ITS INTENT FOR THEIR HEALTH AND SAFETY AND FOR THAT OF THEIR FELLOW EMPLOYEES.**

**Pertinent Safety Personnel****December 2002**

<b><u>Title</u></b>	<b><u>Name</u></b>	<b><u>Location</u></b>	<b><u>Phone</u></b>	<b><u>Pager</u></b>
Division Director	William Schertz	362/C385	630/252-6320	
Division QA Coordinator	Linda Pierce	362/B305	630/252-3857	
Division ESH Training Management Representative	Amy Singletary	362/E377	630/252-0484	630/722-0135
Site Chemical Hygiene Officer	James Woodring	200/L172	630/252-5641	630/612-0473
Division Chemical Hygiene Officer	Amy Singletary	362/E377	630/252-0484	630/722-0135
Division Safety Coordinator	Amy Singletary	362/E377	630/252-0484	630/722-0135